Childhood exposure to the Second World War and financial risk taking in adult life

Contents lists available at ScienceDirect

Journal of Economic Psychology

journal homepage: www.elsevier.com

Childhood exposure to the Second World War and financial risk taking in adult life☆

Davide Bellucci [a], Giulia Fuochi [b], Pierluigi Conzo [c, *]

[a] University of Turin & Collegio Carlo Alberto, Italy
[b] Dept. FISPPA – Applied Psychology, University of Padua, Italy
[c] Dept. of Economics & Statistics "S. Cognetti de Martiis", University of Turin & Collegio Carlo Alberto, Italy

ARTICLE INFO

Keywords:
Financial risk taking
Risk aversion
Stocks
Life insurance
Life experiences
WW2

JEL codes:
D14
D81
D91
G01
G11

PsycINFO codes:
3920
2840

ABSTRACT

Adverse childhood experiences might have long-lasting effects on decisions under uncertainty in adult life. Merging the European Survey on Health, Ageing and Retirement with data on conflict events during the Second World War, and relying on region-by-cohort variation in war exposure, we show that warfare exposure during childhood is associated with lower financial risk taking in later life. Individuals who experienced war episodes as children hold less – and are less likely to hold – stocks, but are more likely to hold life insurance, compared to non-exposed individuals. Effects are robust to the inclusion of potential mediating factors, and are tested for nonlinearity and heterogeneity. Moreover, we provide evidence of hedonic adaptation to war, as high and low intensity of war exposure have comparable long-term effects. We also document that war exposure in childhood increases sensitivity to financial uncertainty since exposed-to-war individuals are less likely to hold stocks after periods of high volatility. Finally, we shed light on the most likely mechanism in the relationship between war exposure and financial risk taking – i.e., enhanced sensitivity to uncertainty – and we show that preferences, and not beliefs, channel this relationship.

1. Introduction

Most financial decisions involve the individual's propensity to take risks, and this propensity depends on several factors. Assuming that one has the cognitive abilities and income or wealth to invest in the financial market, financial literacy is key: low levels of financial knowledge are still very common, and negatively associated with stock holding (Guiso & Jappelli, 2005; Van Rooij, Lusardi, & Alessie, 2011). Other individual characteristics limiting financial investments by most European and US households include: a low level of education of the investor (Guiso, Haliassos, & Jappelli, 2003); genetic endowment, explaining approximately 25% of individual variation in investment portfolio risk (Cesarini, Johannesson, Lichtenstein, Sandewall, & Wallace, 2010); and being female (Sapienza, Zingales, & Maestripieri, 2009).

☆ We thank Compagnia di San Paolo (Turin) for the financial support to the project 'InsideTrust' (PI: P. Conzo). Data and codes are publicly available on figshare, DOI: https://doi.org/10.6084/m9.figshare.8858114.v1.

* Corresponding author at: Dept. of Economics and Statistics "S. Cognetti de Martiis", University of Turin – Campus Luigi Einaudi, Lungo Dora Siena 100A, 10153 Turin, Italy.
Email address: pierluigi.conzo@unito.it (P. Conzo)

https://doi.org/10.1016/j.joep.2019.102196
Received 1 December 2018; Received in revised form 25 July 2019; Accepted 29 July 2019
Available online xxx
0167-4870/

Yet there are also relevant individual factors around personality, attitudes and beliefs: lower extraversion and higher openness to experiences are associated with greater financial assets (Brown & Taylor, 2014); individualism is related to a stronger willingness to take financial risks (Breuer, Riesener, & Salzmann, 2012); participation in the stock market is associated with more social activities (Christelis, Jappelli, & Padula, 2010) and with generalized trust (Guiso, Sapienza, & Zingales, 2008).

All these individual characteristics have something in common: they interact with – and are partially driven by – the environment (e.g., Gottlieb, 1997, 1998), i.e., the places, contexts, and experiences that have shaped one's life. Research has shown that the formation of risk attitudes and the propensity to take financial risks are influenced by important negative life experiences, such as: the loss of a child; being the victim of physical attack (Bucciol & Zarri, 2015); and having been exposed to natural calamities (Cameron & Shah, 2013); conflicts (Callen, Isaqzadeh, Long, & Sprenger, 2014; Cassar, Healy, & Von Kessler, 2017; Kim & Lee, 2014); and macroeconomic shocks (Malmendier & Nagel, 2011).

These studies established the role of traumatic experiences in the formation of risk attitudes by means of lab-experiments in developing countries (Cameron & Shah, 2013; Callen et al., 2014; Cassar et al., 2017) or life-course analysis in more developed societies (Bucciol & Zarri, 2015; Malmendier & Nagel, 2011). However, endogeneity issues, due to non-random exposure to shocks and concerns about the external validity of single-country results, leave open the question of whether early-life hardships shape risk-based decisions over the long run.

We aim to provide an answer to this question by testing whether strong negative childhood experiences have a role in financial choices in adulthood. In particular, we examine whether exposure to World War II (WW2) during infancy affects financial risk taking (stock ownership and stocks' share) and financial choices buffering individuals and families from life events (life insurance).

The region-by-cohort variation induced by WW2 events in Europe provides us with an ideal natural experiment for identifying the impact of childhood hardships on risk attitudes in later life. In addition, since WW2 caused shocks in a variety of European regions, at different developmental stages, our results benefit from a larger degree of external validity than those in previous studies based on a single, developing country.

We exploit retrospective data about childhood conditions (hunger periods, parental absence, dispossession, the health and socio-economic status of the family); adulthood characteristics (income, education, job status, physical and mental health); positive expectations about future outcomes; and (current and past) macro-level characteristics to test whether these factors affect relations between war exposure and financial risk preferences. This allows us to investigate – and possibly to rule out – their mediating role in the link between war and risk taking.

Our results show that exposure to WW2 negatively impacts on stock-ownership and share of stock in financial portfolio, and simultaneously a positive effect on the probability of having life insurance. We find no room for mediating effects of the aforementioned adulthood and childhood characteristics, cognitive abilities, war-related hardships, and macro-level factors interacting with war-exposure and risk preferences.

To enhance the novelty of the contribution, we provide evidence of hedonic adaptation, by showing that a more prolonged or more intense exposure to war has the same long-term effects on financial risk taking as low levels of exposure. We also document that war exposure in childhood increases sensitivity to financial uncertainty, as war-exposed individuals are less likely to hold stocks after periods of high volatility. A series of tests allows us to shed light on the most likely mechanism in the relationship between war exposure and financial risk taking – i.e., enhanced sensitivity to uncertainty – and to understand that preferences, and not (optimistic or pessimistic) beliefs, channel this relationship.

2. Background

2.1. Life shocks and risk preferences

Research on the effects of shocking life experiences on risk preferences has thrown up sometimes contradictory findings. Some studies have documented an increase in risk-seeking attitudes and behavior after dreadful life experiences. These include: large losses in property values after the 2011 Australian floods (Page, Savage, & Torgler, 2014); community deaths due to civil conflict in Burundi (Voors et al., 2012); and evacuation immediately after Hurricane Katrina (Eckel, El-Gamal, & Wilson, 2009).

On the other hand, a greater number of studies reported an increase in risk aversion after negative life shocks, for instance, recent exposure to floods and earthquakes in Indonesia (Cameron & Shah, 2015); the 2004 Asian tsunami (Cassar, Healy, & Kessler, 2017); health shocks – measured by extreme losses in hand grip strength – (Decker & Schmitz, 2016); and being four to eight years old during the peak of Korean war (Kim & Lee, 2014). Malmendier and Nagel (2011) showed that the willingness to take financial risks was lower for people who experienced adverse financial market conditions in the early stages of their lives. Callen et al. (2014) found that individuals exposed to violence in Afghanistan, when primed to recall fear, exhibited an increased preference for certainty. Particularly relevant to this paper is the work of Bucciol and Zarri (2015), showing that individuals who lost a child or experienced a physical attack were less likely to hold stocks, and had a lower share of stocks. As in the present paper, both outcomes were considered, by Bucciol and Zarri, as two measures of risk taking in financial choices.

Concluding that risk tolerance is decreased by life shocks may be too simplistic: first, the association between risk taking and life shocks may depend on the domain of risky choices, for instance, gain vs. losses. In two studies, Li, Li, Wang, Rao, and Liu (2011) found that people living in areas devastated by heavy snowstorms or a major earthquake in China were more likely – than people living in non-devastated areas – to prefer a sure loss to a larger loss with low probability. They were also more likely to prefer a low-

probability associated gain to a sure smaller gain. The experience of a natural disaster increased both risk aversion in the domain of losses and risk propensity in the domain of gains.

Second, the association between risk taking and life shocks may depend on the severity of the shocks. For instance, CEOs who have experienced the extreme downsides of natural disasters tend to lead firms in a more conservative and less risky way compared to CEOs who have experienced disasters without extremely negative consequences (Bernile, Bhagwat, & Rau, 2017). One possible channel may be the accessibility of events in memory: the more shocking, the more salient events are, and events that are more accessible in memory are associated with increased risk aversion (Kusev, van Schaik, Ayton, Dent, & Chater, 2009).

Third, the same life shock may be more or less influential depending on the person's age when the shock occurred: memory and the stage of brain development play a huge role. Infants (one to 18–24 months) are aware of their surroundings and possess a rudimentary form of episodic memory, but they do not have the ability to consciously *remember* (Bauer & Dow, 1994). Long-term ordered recall emerges after around twelve months of life (Carver & Bauer, 2001). Between three to six years children become able to remember events as experienced (Perner & Ruffman, 1995). Moreover, neural circuits develop during sensitive periods of one's life: in sensitive periods experiences have a major influence on brain development, including structures and functions (Fox, Levitt, & Nelson, 2010; Knudsen, 2004). Thus, life shocks occurring during the sensitive period of a certain brain area or neural circuit may affect the functions pertaining to that area or circuit. Consistent with this reasoning, Kim and Lee (2014) found that the Korean War affected risk aversion particularly for respondents who had lived in the provinces where conflict was more intense and who had been four to eight years old during the conflict. Those who had been younger or older were not significantly affected. The authors explained these results with the fact that the prefrontal cortex, which is the main brain region managing risky decision-making, has a strong development at that age (4–8).

As life shocks experienced before adulthood may have a long-term impact, the next section focuses on early life (infancy and childhood) major experiences and their associations with human capital outcomes.

2.2. Major early life experiences and adulthood outcomes

A growing number of economic, psychological and demographic results, based on the life-course approach, have shown that the type of childhood one has had well predicts the adult (s)he will be (e.g. Elder, 2018; Giuliano & Spilimbergo, 2014). A frequent finding in this literature is that exposure to warfare in early life accounts for a large proportion of the variation in health and economic outcomes found in adult life.

Experiencing WW2-related episodes in childhood have been shown to have detrimental effects on the health, education and income of Europeans aged 50 or more (Kesternich, Siflinger, Smith, & Winter, 2014; Havari & Peracchi, 2016). Similarly, Ichino and Winter-Ebmer (2004) provided causal evidence that Germans or Austrians who were ten years old during WW2 had worse educational outcomes than their counterparts in Switzerland and Sweden (neutral countries). Akbulut-Yuksel (2014) exploited region-by-cohort variation in WW2 intensity to document that the war produced negative consequences on human capital and labour market outcomes for those Germans who were children during the war. In Nigeria and Burundi as well, civil war negatively impacted long-term health outcomes (Akresh, Bhalotra, Leone, & Osili, 2012; Bundervoet, Verwimp, & Akresh, 2009).

Early-life exposure to conflict shapes human capital outcomes in later life, and also affects social preferences in a persistent way: Conzo and Salustri (2017) and Grosjean (2014) found that WW2 made exposed individuals less trusting. Hörl, Kesternich, Smith, and Winter (2016) found hunger episodes in German cohorts born after WW2 to have a similar effect on trust. Lab-in-the-field experiments showed short-term effects of conflict on social preferences, with either positive or negative signs, depending on the context. Some studies documented lower cooperation and trust among conflict victims (e.g. Cassar, Grosjean, & Whitt, 2013; Becchetti, Conzo, & Romeo, 2014), while others reported increased prosociality in the aftermath of a civil war (e.g. Voors et al., 2012; Bauer et al., 2016).

Children experience, in war, hunger, poverty, family separation, a lack of resources, but especially a large increase in the perceived probability of risk and unexpected danger. This leads to general uncertainty in both present and future life (Barenbaum, Ruchkin, & Schwab-Stone, 2004; Jensen & Shaw, 1993). To assess the role of all these factors in explaining the association between WW2 and financial risk taking, we consider, in the empirical models, childhood characteristics and adult outcomes stemming from war exposure.

3. Method

3.1. Data and variables

The dataset we use in our study combines four different data sources. The main database is based on five waves (from 2004 to 2015) of the "Survey on Health, Ageing and Retirement" (SHARE)[1]: to investigate the effect of early life shocks on later socio-economic outcomes, we merge such longitudinal data with retrospective information on past life events from the "SHARELIFE" survey.

[1] The SHARE project (SHARE website) is the main longitudinal cross-national survey on European individuals aged 50 or older.

Due to the high number of missing values, we impute, when possible, socio-economic variables and adulthood controls with information extracted from previous (or subsequent) waves or with the median value at country level.[2]

SHARE contains an entire section on financial and real assets. More specifically, it provides information about the amount of directly held stocks and the composition of mutual funds and third-party managed accounts. When such information is not available, we impute the missing values as in Christelis et al. (2010), based on the answer's range as indicated by each respondent. We reconstruct the monetary value of directly held stocks, resources invested in mutual funds and individual retirement account (IRA), and compute the composition of mutual funds and IRA using the self-reported fraction of accounts that are mostly invested in bond, stocks, or equally split (for which we assign value of 75%, 25% or 50–50%).

We consider four different financial outcomes in our regressions. Three of them are dichotomous variables taking value one if the respondent respectively holds direct stocks, life insurance, and direct or indirect stocks. The fourth outcome is the share of directly held stocks with respect to the total amount of stocks, including those indirectly held through mutual funds and IRA. As stocks represent the riskiest financial instrument in SHARE, we use stock ownership and stocks' share as proxies for financial risk taking (Love & Smith, 2010).[3] This practice, well established in the economic literature, was first adopted by Cohn, Lewellen, Lease, and Schlarbaum (1975) and Friend and Blume (1975), and more recently by Malmendier and Nagel (2011) and Bucciol and Zarri (2015). Life insurance is, instead, mostly a financial tool to protect against unexpected negative life events. It can, thus, be considered as a financial by-product of risk aversion regarding life (Browne & Kim, 1993; Yaari, 1965).

As shown in Fig. 1, panel A and panel B, stockowners in Europe are quite rare, except in Denmark and Switzerland, in which two countries 15–20% of total household financial wealth is held in stocks. Life insurance is more common across Europe, with Italy and Greece at the bottom of the ranking. Netting out country, cohort and period effects, individuals who were not exposed to WW2 tend to hold more – or are more likely to hold – stocks, compared to their exposed counterparts (Fig. 2, panel A to C). On the other hand, individuals exposed to war are more likely to have life insurance than their non-exposed counterparts.

The second source of data is an original database we created about WW2 events. It collects information on the number of traumatic war episodes including battles, attacks, bombings, invasions, and occupations as reported by Ellis (1993), Davies (2006) and Collier (2004). In particular, for each war episode during WW2 (September 1939 – July 1945) we registered the date (month and year) and the region in which it occurred (NUTS2 level), collecting a total of 1512 war episodes. To determine respondents' war exposure, we first computed the number of war episodes that occurred in each region in each month during the war years. We then classified each region as exposed to war within a given month of the year, as long as at least one war episode occurred in that time-space window. In this way, each region within each country can be considered to have been either exposed or not-exposed in the same year, depending on the timing of the war episode. For example, Paris Basin region (FR2) was a war-exposed region in 1940 for four months since it suffered episodes in May, June, July and August of that year, but it was not a war-exposed region in March, April or September of the same year. We therefore had the number of war months (months with at least one war episode) for each region in each year of WW2. We, next, combined this data with the information about year of birth and region of residence during WW2 for our respondents. This was done to calculate the number of months of war exposure for each respondent in each year of WW2. More specifically, at an extensive margin, we considered each respondent as being exposed if he/she was living in the war region when the episode occurred. In this way, our war-exposed (treatment) group includes all individuals born after 1929 who experienced at least one month of war events. The non-exposed (control) group, was composed of individuals born after 1929 who did not suffer war episodes in the region where they were living during WW2, together with those born after the end of the war. At an intensive margin, we compute the overall median of months of war exposure across the European countries in our sample. We classify individuals as being highly exposed if the number of months of war that they experienced is above that median (we consider also tertiles of exposure in additional tests). Fig. 3A shows the geographical distribution of months of war across European regions. On average, war exposure was 3 months of war and the most affected region was North Rhine-Westphalia in western Germany, with 35 months of war exposure. Accordingly, respondents who on average suffered most in WW2 lived in north-western Germany (Fig. 3B).

Given our focus on childhood experiences, we decided to exclude individuals born before 1929, who might have actively participated to the war (e.g. because of conscription).[4] This exclusion mitigates the confounding effect in our data of physical and mental injuries due to combat operations, which are not reported and that, hence, cannot be controlled for. We also exclude Spain from the sample as it had a Civil War in the years preceding WW2 and remained under Franco's military regime until 1975. Countries that did not experience war events within their territories, such as Sweden or Portugal, are not included in the analysis.[5] Finally, although we restrict our sample to native respondents, we decided not to exclude from the sample those who changed region of residence during WW2.[6]

[2] More details on the imputation strategy are available in the Electronic Supplementary Material (ESM) 1.

[3] The use of a dichotomous measure of stock market participation has two advantages. First, it mitigates potential measurement errors in reporting the exact portfolio share allocated to stocks. Second, it is less sensitive to market dynamics, which – since individuals might not promptly adjust their portfolio – could make it hard to disentangle whether the observed changes in shares are merely due to changes in stock prices or to risk preferences (Bucciol & Zarri, 2015).

[4] Different sources report Calvin Graham as the youngest soldier in WW2. US born, he participated actively at the age of twelve. The Nazi army had Hitler Youth groups, with young males aged 10 to 14. Our exclusion limits the possibility of including young soldiers in our sample.

[5] Results are robust to the inclusion of Sweden, Portugal and Spain (available upon request).

[6] Less than 2% of the sample changed region during WW2. Our baseline findings are robust to the exclusion of individuals who moved to other regions during WW2 (see Section 4.5).

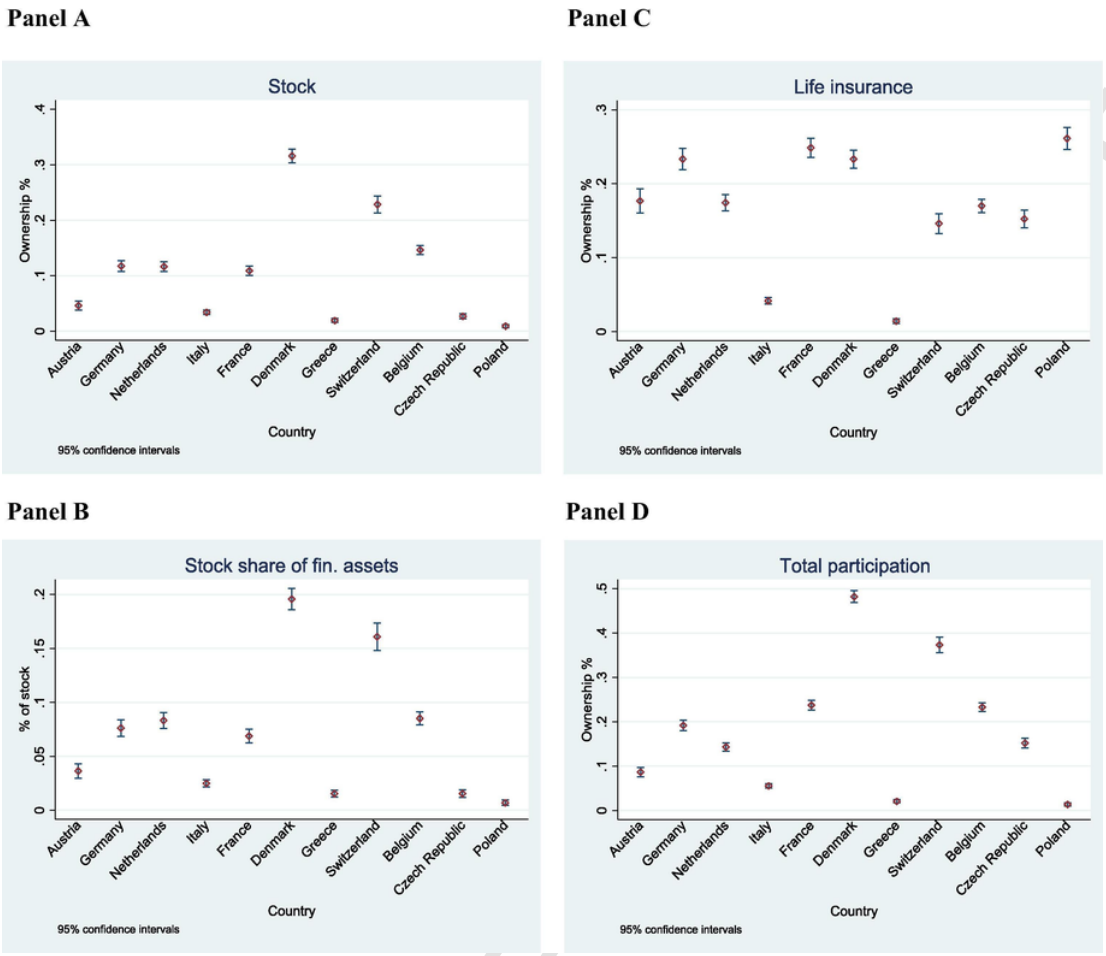


Fig. 1. Financial risk taking by country. *Notes*: The figures report the percentage of stock and life insurance ownership and participation in the financial markets (Panels A, C and D), and average share of wealth held in stocks (panel D), across European countries that participated in the SHARE survey.

The third database contains information about the stock market volatility of the main European indices. The volatility indexes are extracted from the World Bank database and are calculated as the 360-day standard deviation of the return on the national stock market index.[7] We use this variable as an additional regressor in our model when we estimate the effect of increased uncertainty in the financial market, proxied for by high index volatility, on financial behaviour.[8]

The fourth source of data is Eurostat, from which we take yearly measures of real GDP per inhabitant in purchasing power standard (PPS) and rate of unemployment of working-age population (i.e. from 15 to 74 years old) at country level, which we use as controls.

Eventually, as in Kesternich et al. (2014), we employ two war-related variables, proportion of deaths and sex ratio in 1945 and, relying on Maddison (2008), GDP in the years following WW2, each computed at country level. These are used to further control for historical macroeconomic shocks.

All the variables employed in the models are described in the Variable legend in Table SM1, included in Electronic Supplementary Material (ESM) 2, together with their descriptive statistics (Table SM2).

3.2. Descriptive statistics

Table SM2 reports the descriptive statistics (pooled over the waves) of the variables included in our econometric analyses. Around one third of respondents experienced at least one month of war exposure. About 55% of the sample respondents are women, the average age is 66, and more than 70% of the pooled sample has a partner.

[7] World Bank financial database https://datacatalog.worldbank.org/dataset/global-financial-development.
[8] Figure SM1 in ESM 2 shows the index volatility for each country from 2004 to 2015.

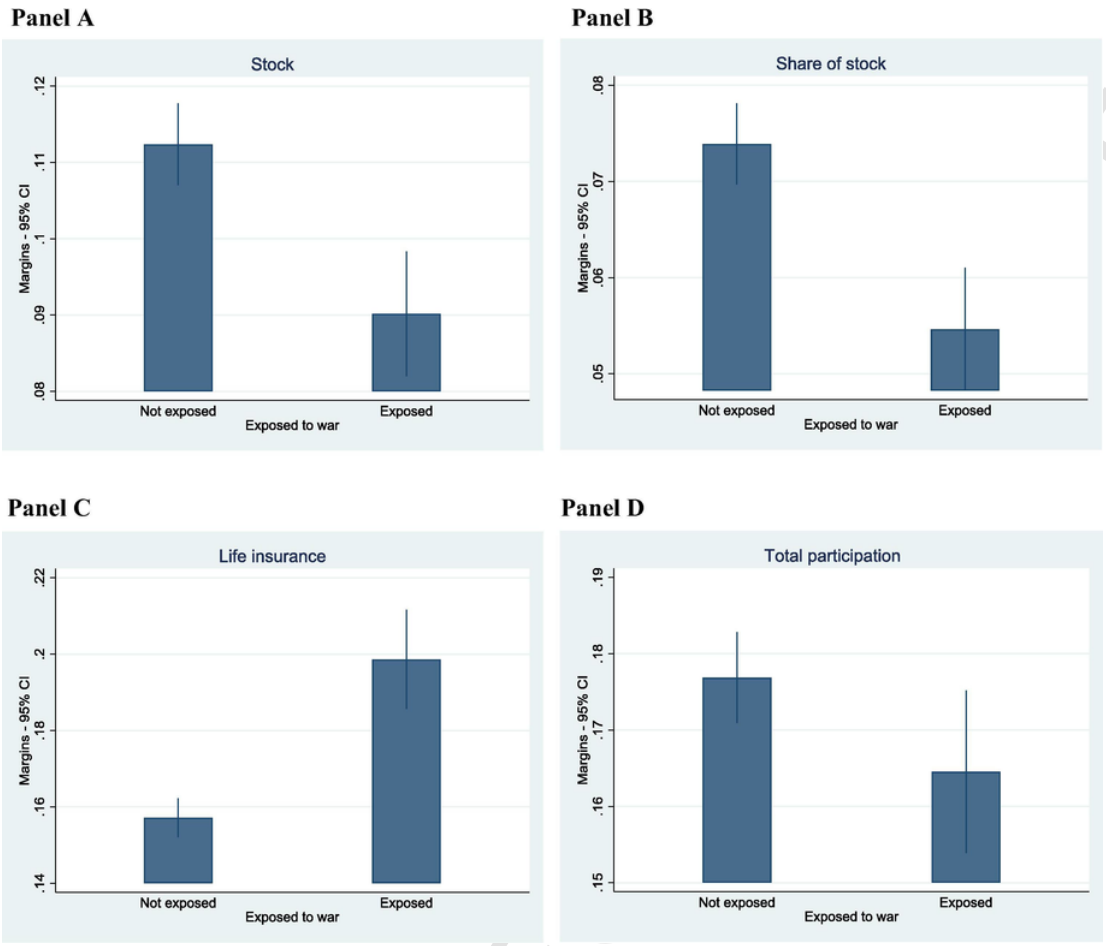
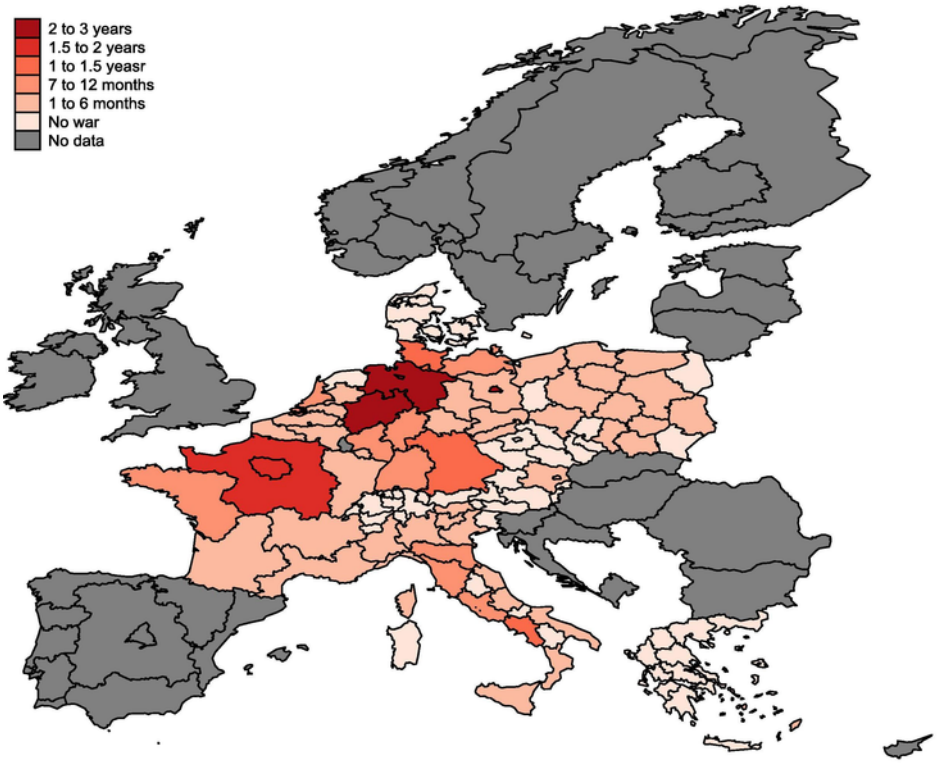


Fig. 2. Financial risk taking by war exposure. *Notes*: The figures report predictive margins from panel probit (Panels A, C and D) or OLS (Panel B) random-effects regressions controlling for wave, country and year of birth.

In accordance with the age composition of our sample, on average each respondent suffers from at least one chronic disease, and memory capacity is quite low (5.2 out of 10), while numeracy and orientation are high. Average individual life expectancy, measured as the subjective probability of being alive in the ten years following the interview-date (independently from current age), is 64%. As to body mass index (BMI), most respondents are overweight (44%) or obese (20%), while a minority has normal BMI (35%). Respondents have, on average, eleven years of education, and most of them (58%) are retired. The average logarithm of income is 9.9 (slightly more than €20,000), while that of financial wealth is 2.6 (around €15,000).

As for the retrospective variables, SES is measured with the first extracted component (Childhood SES) from a factor analysis of four childhood characteristics at age 10: namely, the main occupation of the breadwinner; the number of books at home; the number of rooms *per capita*; and the number of bathrooms in their residence (Havari & Peracchi, 2017; Kesternich et al., 2014). We classify all respondents in the 75th percentile of the distribution of Childhood SES as "high SES". Almost 40% reported living in rural areas at age 10, and almost the entire sample were inoculated during childhood. Fewer than 10% lived without their father, and slightly more than 3% suffered from dispossession episodes. As for cognitive abilities, average memory capacity is, as noted above, quite low (5.2/10), while numeracy and orientation record are respectively 3.88 over 5 and 3.86 over 4.

A – average months of war exposure across EU regions



B – Respondents' average months of war exposure

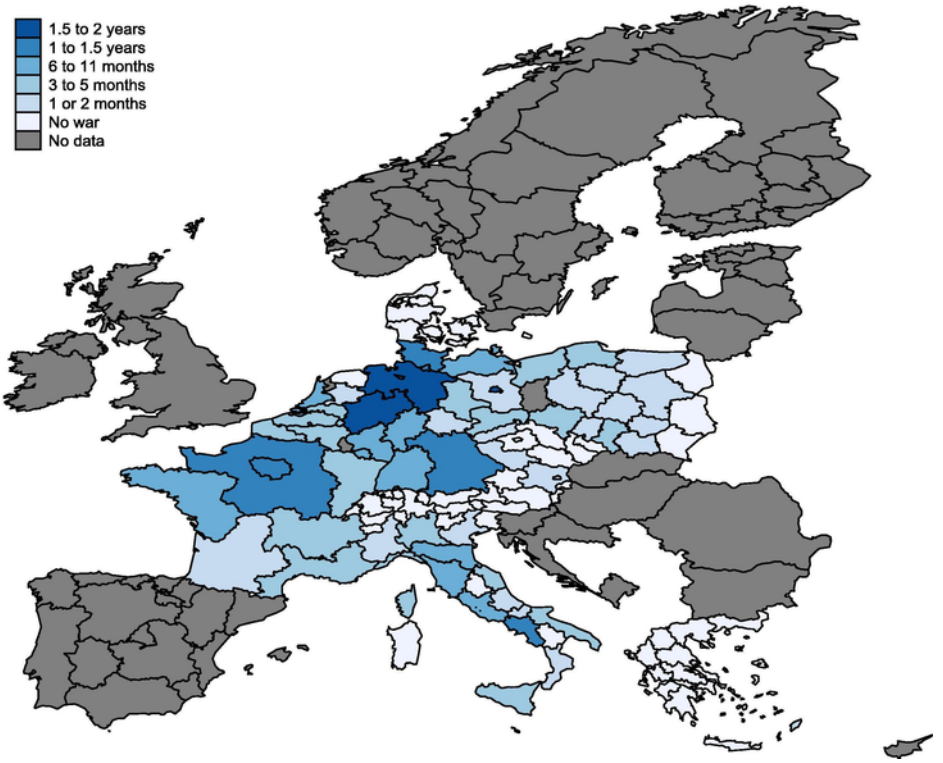


Fig. 3. War exposure by NUTS2 regions. *A – average months of war exposure across EU regions. Notes*: The figures report the distribution of WW2 events in selected European countries. Figure A refers to European regions in our sample across the years 1939–1945. Figure B shows the average number of months of war exposure of our sample respondents.

3.3. Empirical strategy

Our baseline model captures the effect of war exposure (both at the intensive and extensive margin) on financial risk-taking. The estimating equation is reported below, for individual i at wave t.

$$\begin{aligned} Financial\ \ Instrument_{it} = \\ = \beta_0 + \beta_1 War_i + \beta_2 Log\,(Fin\ \ wealth)_{it} + \beta_3 Log\,(Income)_{it} + \beta_4 Gender_i \\ + \sum_c \gamma_c\ \ Country_{it} + \sum_d \lambda_d\ \ Year\ \ of\ \ birth_i + \sum_f \theta_f Wave_{it} + \varepsilon_{it} \end{aligned}$$

Financial Instrument represents one of the four aforementioned financial variables and *War* captures war exposure, either as a dummy variable or expressed in terms of intensity (median and tertiles of months of exposure, with results on tertiles reported in ESM 2). The two logarithmic regressors control for household wealth and income. All models include dummies for country of residence, as well as for year of birth and wave participation, which account for, respectively, cohorts and period effects.[9]

We also investigate whether the effect of war on financial risk-taking is conveyed by other variables that may be both affected by exposure to WW2 and related to risk propensity. If this were the case, including them as controls in additional models would weaken the effects of war compared to the baseline model, and they would be channels – mediators – of the relationship (Baron & Kenny, 1986). The first two sets of potential mediators we include in the baseline model are adult-age socio-demographic characteristics (marital and employment status, years of education, number of children, number of chronic diseases, BMI, smoke and alcohol consumption) and childhood characteristics (SES at age 10, inoculation during infancy, and residence in rural areas). The other potential mediators we use as control variables are: cognitive abilities (memory, numeracy, orientation), mental health (EURO-D depression scale score), war-related hardships (absence of father at age 10, hunger episodes, dispossession), historical and current macro-economic factors (GDP, unemployment, demographic shocks), and optimistic beliefs (subjective life expectancy and health status, belief that life is full of opportunities, trust, and optimism). We include them one at a time, in models already containing adulthood and childhood controls.

As a third step, we investigate nonlinearity and heterogeneity in war effects. We test nonlinearity by measuring war with median and tertiles of months of exposure, and then with the number of months of war and its squared value, while we test heterogeneity with respect to gender and age.

Then, we explore how being exposed to WW2 during childhood affects reactions to periods of high stock-market volatility. Lastly, we perform a number of robustness checks on the results.

Due to the panel structure of the dataset, we conduct random-effects probit (with binary financial outcomes) and random-effects OLS (with share of stocks) regressions with robust standard errors.[10] To facilitate the interpretation of the results, we report average marginal effects.

4. Results

4.1. The effect of exposure to war, controlling for adulthood and childhood characteristics

Table 1 reports the results of the model on (dichotomous) war exposure, while controlling for adulthood and childhood characteristics together (models with adulthood and childhood controls included separately are, respectively, in Table SM3 and Table SM4 in ESM 2). Having suffered at least one month of war during infancy significantly affects all the financial outcomes considered in our study. War exposure has a negative impact on risky assets holding and share, while positively affecting the probability of holding life insurance, which is considered as a safe asset. The riskier the financial instrument (direct stocks ownership compared to indirect participation), the larger the effect of war. In particular, we find that individuals exposed to war during childhood, are 1.8 percentage points less likely to hold stocks in adult age (column 1 Table 1), and 3.3 percentage points more likely to hold life insurance (column 3 Table 1) than those who were not exposed. The share of financial wealth owned in stocks of exposed individuals is on average 1.5 percentage points lower than the one of non-exposed individuals. In line with previous findings in the economic literature (Croson & Gneezy, 2009; Sapienza et al., 2009), we find significant gender differences in risk-taking behavior. On average women are less likely to hold both risky and safe assets, confirming generalized higher risk aversion compared to men. The two controls for

[9] Results without adulthood and childhood controls are available upon request.

[10] Results are robust to random-effect panel OLS estimations with standard errors clustered by country of residence and by year of birth (available upon request).

Table 1
The effect of war exposure on financial risk taking, controlling for adulthood and childhood characteristics.

	(1)	(2)	(3)	(4)
VARIABLES	Stock	Share Stock	Life insurance	Total Participation
Exposed to war	−0.018***	−0.016***	0.033***	−0.009***
	(0.004)	(0.004)	(0.007)	(0.004)
Female	−0.013***	−0.013***	−0.006	−0.006***
	(0.003)	(0.003)	(0.004)	(0.002)
Log financial wealth	0.015***	0.022***	0.020***	0.026***
	(0.000)	(0.000)	(0.000)	(0.000)
Log Income	0.013***	0.005***	0.009***	0.003**
	(0.001)	(0.001)	(0.002)	(0.001)
High SES at age 10	0.002	0.001	0.002	0.002
	(0.003)	(0.003)	(0.004)	(0.002)
Lived in a rural area when child	0.001	0.003	−0.005	−0.003
	(0.003)	(0.002)	(0.004)	(0.002)
Received vaccination when child	0.003	0.003	0.030***	−0.014**
	(0.007)	(0.004)	(0.012)	(0.007)
Divorced or separated	−0.016***	−0.012***	0.002	−0.005
	(0.004)	(0.004)	(0.006)	(0.003)
Never married	−0.001	−0.001	−0.020***	−0.005
	(0.006)	(0.006)	(0.008)	(0.005)
Widowed	0.006	0.002	0.009	0.006**
	(0.004)	(0.003)	(0.006)	(0.003)
Employed or self-employed	0.003	0.002	0.034***	0.004
	(0.003)	(0.003)	(0.005)	(0.003)
Unemployed	−0.005	−0.008	0.008	0.002
	(0.006)	(0.006)	(0.009)	(0.006)
Permanently sick or disabled	0.002	0.000	0.010	−0.004
	(0.007)	(0.005)	(0.008)	(0.006)
Homemaker	0.001	0.003	0.002	−0.000
	(0.005)	(0.003)	(0.006)	(0.004)
Other	0.005	0.003	0.061***	−0.013
	(0.008)	(0.007)	(0.012)	(0.008)
Number of children	−0.004***	−0.001	0.002	−0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Years of Education	0.004***	0.002***	0.001**	0.001***
	(0.000)	(0.000)	(0.001)	(0.000)
N. of chronic diseases	−0.000	0.001	0.002	−0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Normal weight	0.018	0.005	0.005	0.024**
	(0.010)	(0.009)	(0.015)	(0.010)
Overweight	0.013	0.001	0.016	0.022**
	(0.010)	(0.009)	(0.015)	(0.010)
Obese	0.011	0.001	0.023	0.020
	(0.010)	(0.009)	(0.015)	(0.011)
Low alc. consumption	0.013***	0.005**	0.021***	0.011***
	(0.004)	(0.002)	(0.004)	(0.003)
Medium alc. consumption	0.015***	−0.002	0.029***	0.012***
	(0.003)	(0.003)	(0.004)	(0.003)
High alc. consumption	0.019***	0.012***	0.022***	0.014***
	(0.004)	(0.003)	(0.005)	(0.003)
Smoke at the present time	−0.009***	−0.005	0.009**	−0.004
	(0.003)	(0.003)	(0.004)	(0.003)
Observations	53,336	52,610	51,396	56,931
Dummy Country	Yes	Yes	Yes	Yes
Dummy wave	Yes	Yes	Yes	Yes
Year of birth	Yes	Yes	Yes	Yes

Note: Marginal effects after probit panel estimation (columns 1, 3 and 4) and OLS panel estimation (column 2); Robust standard errors in parentheses; C.I. ***p < 0.01, **p < 0.05.

household wealth show effects in line with our predictions. Higher available resources are positively related to the probability of holding financial instruments.

As for marital status (living with a partner is the omitted benchmark), we find that being divorced or separated is negatively associated with the probability of holding risky assets, and the effect is similar for the number of children. Health status, measured by the number of chronic diseases respondents suffer from, does not yield statistically significant results. As to job status (being retired is the omitted benchmark), we find that being employed is the only category that increases the probability of a respondent holding life insurance. Better educated individuals are more likely to hold financial instruments, either risky (stocks) or risk-free (life insur-

ance) assets. Previous research showed that risky behaviour correlates positively with financial risk tolerance (Dave & Saffer, 2008). We find, though, that all categories of alcohol consumption (no consumption omitted category) are positively associated with financial risk propensity, and that smoking habits are negatively associated with risky assets ownership, though the effect is not robust in all specifications.

Moving to childhood controls, findings are in line with the literature on parental transmission of risk preferences (Dohmen, Falk, Huffman, & Sunde, 2011). Those who had relatively higher socio-economic status in childhood are more likely to invest in risky instruments in adult age, and those who received vaccination are more prone to invest in life insurance (Table SM4 in ESM 2). The former result is not robust in the full specification model, when we jointly control for child and adulthood characteristics. This suggests that the effect of SES at the age of 10 may be absorbed by adulthood socio-demographic characteristics.[11]

4.2. Investigating alternative explanations

4.2.1. Mental health and cognitive abilities

As alternative explanations, we first consider cognitive abilities (Table SM5 in ESM 2) and depression status (Table SM6 in ESM 2). We do so to rule out the possibility that the detrimental effect of war on financial risk taking is due to impaired cognitive abilities and mental health. Table SM5 shows that numeracy positively predicts financial risk taking, as in Christelis et al. (2010). However, we do not find evidence that cognitive abilities play a mediating role: the marginal effect of war exposure does not change in magnitude in comparison with the baseline specification with adult and childhood controls. In the same vein, mental health is not able to explain variations in investments in risky assets (Table SM6 in ESM 2).

Despite having controlled for numeracy, orientation, and memory, it is important to acknowledge that war-related trauma could induce a more general cognitive strain in exposed individuals, in turn restraining their financial risk taking. To test this channel, we first compared the different effects of war exposure on the likelihood of holding stock, mutual funds, bonds, Individual Retirement Account (IRA), and contractual savings, both without and when controlling for cognitive abilities, and we found that exposure to war was negatively related to the probability of holding stocks, but not to the probability of holding other financial instruments. This suggests that enhanced risk aversion, rather than cognitive strain, is more likely to be the main mechanism underlying our results (Table SM7 in ESM 2). Secondly, we tested whether exposure to war affected financial asset allocations, characterized by different levels of risk and direct vs. indirect participation (Table SM8 in ESM 2). War exposure was positively related to the "share of low-risk assets" (the ratio between the sum of directly held bonds, indirectly held bonds, life insurance and contractual savings and total financial wealth). It was, instead, unrelated to the ratio of directly vs. indirectly held stocks. These results suggest that war exposure is associated with risk aversion in financial choices, and that cognitive strain – keeping risk aversion constant – is not a relevant mechanism. If it were so, individuals exposed to war would choose indirectly – over directly-held stocks, as indirect participation reduces the amount of cognitive resources needed to manage the chosen financial instrument(s).

4.2.2. Hunger, dispossession and parental absence

Results in Table 2 show that the absence of a father at age 10 is positively related to the ownership of life insurance. As the magnitude of the marginal effects of war exposure remains unaltered and statistically significant with respect to each one of our four variables of interest, war-related hardships do not appear either to be channels of the effects of war exposure on financial risk taking. It is important to note that these hardships differ from simple exposure to WW2. Dispossession, hunger, and parental absence are household-related consequences of the war that affect the individual from a practical point of view. When we control for these variables, together with childhood controls, the effect of exposure to war is separated from the effect of household-based conditions during war. As such, it can be interpreted as a pure effect of the context. We argue that this context effect involves the horrors of the war: for instance, seeing dead bodies lying in the streets and destroyed houses, the sound of air raid sirens, bombings, the Holocaust, witnessing murders or other violent acts, family separation. These mean fear, and this is likely to affect sensitivity to uncertainty, simultaneously fostering a preference for safe environments. Hence the lower likelihood that the exposed respondent, in later life, takes financial risks, and the higher likelihood of holding life insurance.

4.2.3. Macro-level factors

There is an additional advantage of assessing the long-term effects of a global shock on the behavior of respondents residing in different countries: we can exploit the cross-country dynamics of the war, and check how these interact with war exposure and risk taking. First, controlling for country dummies in the aforementioned estimates is not a trivial matter; it allows us to check whether exposure to a worldwide conflict has a long-term impact on preferences independently from time invariant, country-specific characteristics such as institutions and geography. These characteristics might, indeed, interact with the dynamics of WW2, the recovery

[11] We do not find a statistically significant effect of the interaction term between war exposure and SES at the age of 10 (results available upon request). This rules out a moderating role of the familiar environment in childhood.

Table 2
The effect of war exposure on financial risk taking, controlling for war-related hardships.

	(1)	(2)	(3)	(4)
VARIABLES	Stock	Share Stock	Life insurance	Total Participation
Exposed to war	−0.018***	−0.015***	0.033***	−0.010***
	(0.004)	(0.004)	(0.007)	(0.004)
Father absent at age 10	−0.007	−0.007	0.013**	0.002
	(0.005)	(0.004)	(0.006)	(0.004)
Hunger	−0.002	0.000	0.003	0.005
	(0.006)	(0.004)	(0.008)	(0.005)
Dispossession	0.012	0.006	0.003	0.006
	(0.007)	(0.006)	(0.010)	(0.005)
Observations	53,309	52,584	51,367	56,901

Note: Marginal effects after probit panel estimation (columns 1, 3 and 4) and OLS panel estimation (column 2); Robust standard errors in parentheses; C.I. ***p < 0.01, **p < 0.05; Columns (1) – (4) include adulthood and childhood controls, country, wave and year of birth dummies.

after said war and risk preferences. Our results that show that exposure to war has a significant effect, even controlling for country dummies, implies that country time-invariant characteristics do not matter.[12]

To disentangle the effect of WW2 from the effects of macro-economic conditions related to – and brought along by – the same war, we re-estimate models in Table 1, by adding controls for past and current macro events likely to be related to risk preferences (one separate model for each control). Concerning past macro events, we controlled for the GDP of the country in which the respondent lived at age 10 (GDP in the year in which the respondent was 10, divided by *per capita* GDP in 2006, as in Kesternich et al., 2014), the country-specific proportion of deaths by 1945 (number of civilian and military deaths by 1945 over total population in 1939), and demographic shocks (sex ratio of women to men in 1945, taken from Kesternich et al., 2014). Concerning current macro events, we controlled for current GDP and country-specific unemployment rates. Results are reported in Table SM9 in ESM 2, and show that in all the models, the effect of exposure to WW2 is robust to the inclusion of current and past macro events, even the ones strongly related to the presence of war, such as the proportion of deaths in 1945. This finding suggests again that the horror and violence of a war witnessed while young might affect risk preferences independently of macro-level factors.

Finally, we run a check for heterogeneity of war exposure by WW2-coalitions in order to assess whether being on the side of the "winners" or of the "losers" played a role. Results are reported in Table SM10 in ESM 2 and show that there are no systematic differences in stock-market participation among exposed respondents from countries that won *vis-à-vis* those from countries that lost. This result provides evidence that "winning" or "losing" did not affect the development of risk preferences. It also suggests, together with former results, that the impact of war atrocities on financial risk taking is not mediated by macro-level factors.

4.2.4. Optimistic beliefs and positive expectations about the future

Experiencing macro-level events that have dramatic personal consequences may influence both risk preferences and beliefs – for instance, optimistic or pessimistic beliefs on future macroeconomic outcomes –, which in turn may affect financial risk taking (Das, Kuhnen, & Nagel, 2019; Malmendier & Nagel, 2011, 2015). In this study, pessimistic expectations about macroeconomic conditions could reduce stock investment, while pessimistic beliefs about future life events may increase life insurance holdings.

The results here suggest that sensitivity to uncertainty, and a preference for safe situations, are likely to convey the effect of war exposure on financial risk taking. To rule out the possibility that this effect was, instead, driven by pessimistic beliefs about life and the environment, we repeated the models in Table 1 controlling for beliefs about one's life and health (subjective life expectancy, subjective health status and the belief that life is full of opportunities)[13], and beliefs about the behaviors of others (trust, and optimism).

Results (Table SM11) show that exposure to war was robust with the inclusion of these controls, offering support to the idea of the "preference" channel (sensitivity to uncertainty), rather than the "belief" channel.

4.3. Addressing nonlinearity and heterogeneity of effects

As individuals tend to adapt to shocks (Lyubomirsky, 2010), we test whether the effect of the intensity or duration of war exposure on financial risk taking is nonlinear: the magnitude of that effect could increase with the intensity of exposure (linearity), or be similar at different (extreme) levels of exposure (hedonic adaptation).

[12] The lack of a mediating role of time-invariant socio-economic and institutional arrangements proxied for by country dummies survives the restriction to WW2-born cohorts and the control for region (instead of country) fixed characteristics that might interact both with exposure to war and risk-taking behavior (see Section 4.5).

[13] Relatedly, Arpino, Conzo, and Salustri (2019) show that WW2-exposure in childhood increases later life optimism in subjective evaluations of longevity. They argue that this might be due to the post-traumatic growth of exposed individuals.

We, therefore, estimate the impact of being above vs. below the median months of exposure relative to being non-exposed (omitted category); we also check for statistically significant differences between the estimated above- vs. below-median coefficients. Results in columns 1–2 of Table 3 and the test on equality of the coefficients of the above vs. below-median exposure (reported below Table 3) show that prolonged exposure to WW2 has the same (negative) effect on stock holding and stocks share as that of shorter exposure. There is apparently, then, a non-monotonic relationship. This result is also found when using tertiles of exposure (Table SM12 in ESM 2), whereby WW2 has about the same impact both for those exposed for a few months and for those exposed for a longer period.

As an additional test for nonlinearity, we use two discrete measures of exposure respectively capturing war duration (number of years) and war intensity (number of war events over the six years of the war). Results are reported in columns 3–4 for war duration and 5–6 for war intensity (Table 3), while graphs of quadratic predictions are in Figures SM2-3 (ESM 2). In both cases, we find a u-shaped relationship, with short and prolonged exposure producing similar effects, although the coefficient of the linear term of war intensity is not significant at the conventional 5% probability level (column 5 Table 3, $p = 0.077$).

Overall, results suggest hedonic adaptation. WW2-exposure reduces financial risk-taking, but up to a certain point: after a long series of war episodes, individuals adapt and become less sensitive to uncertainty.

Then, we explore heterogeneity in the effect of war by gender (Table SM13a-b in ESM 2) and age of exposure (Table SM14 in ESM 2). Women's higher risk aversion compared to men is a well-known finding in the economic literature. Table SM13a in ESM 2) shows that exposed women tend to participate less in the stock market than men; however, there are no significant differences in the other financial outcomes under consideration. To check for differential behaviour by gender at different levels of exposure, we compare coefficients of above- vs. below-median exposure, separately for men and women. Table SM13b (in ESM 2) shows that war exposure has a larger impact for men than for women. Considering stock-market participation and share of stocks, hedonic adaptation tends to occur mostly for men, while for women the detrimental effect of a war experience increases with the length of exposure. Specifically, with respect to stock ownership, the marginal effect of under-median exposure for men is almost 3 times as big as the marginal effects for women (−0.028 vs −0.011, p-value = 0.073; columns 1 and 5). The same result holds considering the share of stocks; the marginal effect of under-median exposure on men is higher than for women (−0.024 vs −0.007, p-value = 0.030; columns 2 and 6). As for life insurance, we find a similar pattern with marginal effects being relatively stronger for males, yet differences by gender are not statistically significant. Regarding total participation, coefficients of above- and below-median exposure for men seem to offset each other, though they are not statistically significant (column 8); for women, instead, the above- vs. below-median effects go in the same direction, but exposure matters only at low levels of exposure (column 8). Results for total participation show hedonic adaptation for women, as well; nevertheless, gender differences at different levels of exposure are not statistically significant.

Regarding age classes (Table SM8 in ESM 2), we find that being exposed to war at between nine and fifteen years of age has the most detrimental (and robust) effect on financial risk taking in adult age (columns 1 and 2), whereas it has a positive effect on the probability of holding life insurance. Moreover, having been zero to three years old during exposure to WW2, is negatively related to stock ownership and positively related to life-insurance ownership, while having been four to eight years old seems to have no effect. Wald tests between coefficients of the classes 0–3 and 9–15 reveal that the difference is statistically different from zero for stock ownership, share of stock, and life insurance. Thus, the effect of war on financial risk taking is heterogeneous for age, with

Table 3
Testing nonlinearity in the effect of war exposure (median exposure, war duration, and war intensity) on financial risk taking.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Has stock	Share stock	Has stock	Share stock	Has stock	Share stock
Under median exposure (a)	−0.018***	−0.016***				
	(0.004)	(0.004)				
Above median exposure (b)	−0.018***	−0.015***				
	(0.005)	(0.005)				
N. of years of war			−0.027**	−0.025**		
			(0.010)	(0.010)		
N. of years of warˆ2			0.011**	0.012**		
			(0.005)	(0.005)		
N. of war events					−0.024	−0.024**
					(0.014)	(0.012)
N. of war eventsˆ2					0.016**	0.019**
					(0.008)	(0.009)
Observations	53,336	52,610	53,336	52,610	53,336	52,610
Test	(a)-(b)	(a)-(b)				
Chi squared	0.02	0.03				
p-value	0.896	0.860				

Note: Marginal effects after probit panel estimation (columns 1, 3 and 4) and OLS panel estimation (column 2); Robust standard errors in parentheses; C.I. ***p < 0.01, **p < 0.05; Omitted category columns (1) – (2): "Not Exposed". Columns (1) – (6) include adulthood and childhood controls, country, wave and year of birth dummies.

stronger effects for respondents in the 9–15 age class during WW2. The effect is stronger for older children because during WW2 they would most likely be helping the family in adverse conditions, and they were more aware of hardships (Werner, 2000).

4.4. War exposure and reactions to high-volatility periods

We proceed with our analysis by investigating the role of war exposure during childhood on financial decisions after periods of high stock-market volatility. Our hypothesis is that if war-exposed individuals are more sensitive to uncertainty, they would be more likely to rebalance their holdings than non-exposed individuals when the variance (and hence uncertainty) of returns, increases.

In order to study the effect of uncertainty in the stock market, we take information on the volatility of stock price index at country level. Each respondent has been matched with the volatility index, relative to the year preceding the interview, of his/her country of residence. Then, for each year, we ranked countries according to their stock volatility index and created a dummy with value one if the country is in the top 20% of the volatility index distribution (*high volatility*).

To test the heterogeneous effect of high past volatility on stock-market participation and share of directly owned stocks, we interact the high-volatility dummy with the war exposure dummy. High volatility is positively associated with participation in the stock market and, especially, with share of stocks (Table 4). Individuals exposed to war and to high volatility are 1.5 percentage points less likely to hold stocks than individuals that did not experienced high volatility (columns 3 and 5 Table 4). Similar results hold for stock shares. Individuals who both suffered war episodes during childhood and high volatility in adulthood, have a share of stock that is on average 0.4% lower (columns 4 and 6 Table 4). This result is probably driven by the most risk-loving individuals in the sample, who – attracted by the prospect of high gains – overinvest in risky assets as volatility increases.

However, with respect to heterogeneity by war-exposure, we find that war-exposed individuals tend to participate less in the stock market than non-exposed individuals after periods of high volatility, e.g. during the 2009 financial crisis (see Figure SM1 in Supplementary Materials 2). This result stays robust when we control for cognitive abilities (Table 4, columns 5–6), ruling out the possibility that higher sensitivity to volatility for the war-exposed is due to the impaired cognitive abilities of this group.

Overall these results are consistent with the hypothesis that the experience of WW2 in childhood increases sensitivity to uncertainty, driving exposed individuals to reduce stock holding later in life, especially when faced with the high uncertainty of stock-market returns.

4.5. Robustness checks

Although SHARE informs us about the region of residence during each year of WW2 and permits us to track respondents' migration, it does not contain detailed information about the month in which respondents started living in their new place of residence[14]. Hence, we cannot be sure about whether respondents arrived in a war region before, or just after, the war episode occurred. We addressed this issue by re-estimating Table 1 models without individuals who migrated during the WW2 period. Furthermore, to rely on a control group that is more similar to our treatment group (made up of war-exposed respondents), we excluded individuals born after the end of WW2. The results of both these robustness checks (available upon request) are consistent with our previous findings (including the magnitude of coefficients), with war exposure negatively affecting financial risk taking. Consider that the fraction of migrants in our sample, though it may seem too low (2%), is in line with external data: the population in our sample countries was about 344 million in 1939[15], while the estimated number of refugees in Europe in 1945 was around seven million (Barnett, 2002). Regarding out-of-sample migration, Kesternich et al. (2014) and Conzo and Salustri (2017) provide evidence that migration outside the countries in our sample during and after the war (1939–1947) was not easy. In addition, migration to the US from the 1920s to 1965 was at its minimum levels due to restrictions, imposing a ceiling on the number of immigrants accepted each year.

So far, we have relied on the *year* of birth and region of residence to merge retrospective information with WW2 data. To identify war exposure for each respondent more precisely, we exploit the within-region variation stemming from the *months* of respondents' birth and the *months* of war episodes. To this end, we restrict the sample to individuals born during WW2 (i.e. 1939–1945) and classified as "exposed" those who were born in a war region, at least one month before a war event occurred there[16]. By exploiting within-region variation in war exposure, we also net out the effects of time-invariant institutional, geographical, and macroeconomic features at the regional level, features which might affect both war exposure (and its intensity) and local recovery capacity. If, through this identification strategy, we gain in terms of the causal interpretation of results, we lose the generalizability of results to other cohorts. Results reported in Table SM15 in ESM 2 confirms our previous findings.

Selection on mortality might also be a threat to our identification strategy. Despite not being able to address this issue with the data at our disposal, we would argue that selection on mortality does not lead to a severe bias in our estimates. First, the previous analysis on the specific cohort of those born during WW2 might mitigate selective mortality induced by WW2. Compared with older

[14] Migration within country during WW2 can be a concern because selective targeting of industrialized or dense regions would have pushed individuals to emigrate. Controlling for region fixed effects in the robustness check performed below permits us to mitigate potential endogeneity driven by non-random war targeting of regions and differential migration induced by war operations.

[15] Data source: Lahmeyer, 2006, Populstat [online]; available at http://www.populstat.info; own elaboration.

[16] Our control group, in this case, is composed of individuals who were born and grew up in no-war regions and by those who were born in war regions but at least a month after WW2 events occurring in those regions. See Conzo and Salustri (2017) for more details about this identification strategy.

Table 4
The combined effect of exposure to war and high stock volatility on financial risk taking.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Stock	Share stock	Stock	Share stock	Stock	Share stock
Exposed to war	−0.019***	−0.015***	−0.015***	−0.012***	−0.015***	−0.012***
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
High stock volatility	−0.002	0.002	0.005	0.006**	0.005	0.006**
	(0.003)	(0.002)	(0.004)	(0.003)	(0.004)	(0.003)
Exposed*High stock volatility			−0.020***	−0.010***	−0.021***	−0.011***
			(0.006)	(0.004)	(0.006)	(0.004)
Observations	42,979	43,039	42,979	43,039	42,494	42,524
Cognitive abilities	No	No	No	No	Yes	Yes

Note: Marginal effects after probit panel estimation (columns 1, 3 and 4) and OLS panel estimation (column 2); Robust standard errors in parentheses; C.I. ***p < 0.01, **p < 0.05; Columns (1) – (6) include adulthood and childhood controls, country, wave and year of birth dummies.

cohorts, individuals born during WW2 are less subject to mortality and to the scarring effects of war exposure (Havari & Peracchi, 2017). Relying on the SHARE dataset, Havari and Peracchi (2017) provide evidence of low levels of childhood mortality during WW2 even in war countries; they also show that mortality at later ages was not systematically higher for those born during the war. Second, Kesternich et al. (2014) – who also use SHARE – address the issue of differential mortality by war-induced SES. In our case, this source of selection would lead to an overestimation of the war effect if mortality was higher among low-SES respondents. The latter tend also to participate less in the stock market than high-SES respondents (Table SM4 in ESM 2). To assess the severity of selection, Kesternich et al. (2014) compare the age of death of the respondents' father by SES, by war vs. non-war countries, and by year of birth (before 1946 vs. after 1945). They find that both low- and high-SES respondents face almost the same reduction in the age of death of fathers, and conclude that this type of selection is not large enough to drive their findings.

Finally, the negative effect of war exposure on stocks share could be driven by the more exposed individuals investing less in direct and more in indirect forms of stock holding. In order to check whether this is the case, we rely on three tests. First, as shown in Section 4.2.1 (Table SM7 in ESM 2), exposed individuals do not seem to compensate lower stock-market participation with participation in other financial assets such as bonds, IRA, Mutual Funds and Contractual Savings. Second, exposed individuals tend to invest more in risk-free assets (columns 1 and 3, Table SM8 in ESM 2), but do not substitute direct with indirect participation when risk is kept constant, i.e. when we compare the share of directly vs. indirectly held stocks (columns 2 and 4, Table SM8 in ESM2). The last robustness check regards the definition of the "share of stock" variable: we compute the share of stock owned as a function of the total wealth as in Bucciol et al. (2015). Results are robust to this check, even when controlling for cognitive abilities (Table SM16 in ESM 2). All these estimates suggest that the observed reduction in the share of stocks is not due to a change in the denominator: exposed individuals do not seem to allocate relatively more to indirect stock holdings.

5. Discussion

This paper investigates the long-term effect of WW2 on financial risk taking (stock ownership and stocks' share) and on financial choices protecting respondents from life events (life insurance). It does so through a tight identification strategy based on region-by-cohort variation in war exposure. Results show that childhood exposure to WW2 decreases by about two percentage points the probability of holding direct and indirect stocks, and by about one percentage point and a half the share of stocks in later life. Exposure to WW2 also increases by three percentage points the probability of having life insurance in adulthood. The effects of war are almost unchanged when including classic socio-economic controls, childhood and adulthood characteristics, war-related hardships, past and current macro-level factors, proxies for optimistic beliefs about future outcomes, and cognitive abilities and mental health at the time of the interview. Thus, we may conclude that such effects are not conveyed by impaired cognitive abilities and mental health, or other individual and macro-level variables affected by war and potentially related to financial choices. Childhood exposure to war has a direct, persistent negative effect on financial risk taking.

With respect to the extant literature, we contribute in several different ways. We provide evidence of hedonic adaptation, since high intensity or duration of war exposure has the same impact as low levels of exposure; we show that war-exposed respondents are less likely to hold stocks after periods of high volatility, suggesting that they are more sensitive to uncertainty. Through a series of tests, we shed light on the most likely mechanism in the relationship between war exposure and financial risk taking – i.e. enhanced risk aversion and preference for safer environments – and we show that preferences, and not (optimistic or pessimistic) beliefs, channel this relationship.

The negative relationship between financial risk taking and exposure to WW2 is consistent with results from previous research (Bucciol & Zarri, 2015; Cameron & Shah, 2015; Kim & Lee, 2014). This suggests that life shocks may be able to change cognitive schemata in subtle ways, not captured by an individual's physical, psychological, or socio-economic conditions. Cognitive schemata stem from the generalization of past experiences into cognitive structures that in turn guide the processing of new information and experiences (Stotland & Canon, 1972). Thus, schemata influence how reality is perceived, and because they are rigid, individuals tend to fit reality into schemata, rather than adapting them to new information.

In this perspective, the experience of WW2 during childhood would be a fundamental constituent of exposed individuals' cognitive schemata. In particular, exposure to conflict might have increased the perception of uncertainty and lack of control over the environment (Barenbaum et al., 2004). This leads, in turn, to an increase in risk aversion and safer financial investments in exposed individuals, compared to non-exposed ones. Hence the lower propensity to invest in stocks, and the higher propensity to buy life insurance. The amount of risk characterizing stocks may be perceived to be unmanageable, whereas life insurance may be considered necessary to counteract life adverse conditions and negative events.

Our results are also consistent with Kim and Lee (2014) in showing that exposure to war during childhood reduces risk taking during adulthood. The effect of strong and negative early life experiences on risk propensity is enduring. This may occur because the shock alters the development of the prefrontal lobe (Kim & Lee, 2014), which is one of the main brain regions involved in risk-related decision-making (Figner et al., 2010). But it might also alter cognitive schemata, especially in ages beyond the sensitive period of the prefrontal lobe.

We also acknowledge the possible presence of war-related traumas captured neither by our childhood and adulthood controls, nor by mental health and cognitive skill variables. Adults who were exposed to war as children may suffer from Post-Traumatic Stress Disorder (PTSD) symptoms (Macksoud & Aber, 1996) that are not fully captured by the depression scale in SHARE. WW2 caused an unprecedented amount of civilian losses and bombardments (Werner, 2000), which led people, even at a young age, to witness – and to remember – these events (Berntsen & Rubin, 2006). Such experiences may be the ones increasing the perception of risk (for instance, in stock holding), and the willingness to reduce or control life risks (stimulating the purchase of life insurance).

As these effects held when controlling for a number of individual and macro-level factors also related to the conflict, we may conclude that the main channel of the relationship is enhanced sensitivity to uncertainty and to risky circumstances. This sensitivity, the results suggest, was fostered by the unpredictable, fear-inducing horrors of the war.

We also have to acknowledge several limitations in this paper. First, when we measure the months of war of each region in each year of WW2, we do not distinguish between regions with one, five, or ten episodes of war in the same month. This approach overlooks the intensity, then, of conflict based on the number of war episodes, and the possible differences in the intensity of single war episodes. However, this does not appear to be a severe concern since results hold also when considering number of WW2 events instead of months of exposure. Second, there might be small inaccuracies in the number of months of exposure to war because we use the region of residence during WW2, but we cannot check when respondents started living in that region. This issue was partly addressed through a robustness check on the sample of individuals who did not relocate during WW2. Third, the estimated magnitude of the WW2-effect might appear negligible. However, it is very close to the effect of income and other important controls.

Despite these limitations, our paper finds robust effects of exposure to WW2 on financial risk taking. Exposed individuals prefer to avoid risky financial instruments, while purchasing life insurance. Increasing wealth by investing in stocks may not be alluring, compared to, for them, the more important task of defending what they already possess. The experience of war, with its dangers and uncertainty, might yield a strong willingness to protect life and avoid risk. Life, after all, will quite possibly be more valuable to those who once thought that they could lose everything.

Uncited references

Agresti (2010).

Declaration of Competing Interest

None.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.joep.2019.102196.

References

. remove reference.
Akbulut-Yuksel, M., 2014. Children of war the long-run effects of large-scale physical destruction and warfare on children. Journal of Human Resources 49 (3), 634–662.
Akresh, R., Bhalotra, S., Leone, M., Osili, U.O., 2012. War and stature: Growing up during the Nigerian civil war. American Economic Review 102 (3), 273–277.
Arpino, B., Conzo, P., Salustri, F., 2019. I'm a survivor, keep on surviving: Early-life exposure to conflict and subjective survival probabilities in adult life. University of Turin.
Barenbaum, J., Ruchkin, V., Schwab-Stone, M., 2004. The psychosocial aspects of children exposed to war: Practice and policy initiatives. Journal of Child Psychology and Psychiatry 45 (1), 41–62.
Barnett, L., 2002. Global governance and the evolution of the international refugee regime. International Journal of Refugee Law 14 (2_and_3), 238–262.
Baron, R.M., Kenny, D.A., 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. Journal of Personality and Social Psychology 51, 1173–1182.
Bauer, M., Blattman, C., Chytilová, J., Henrich, J., Miguel, E., Mitts, T., 2016. Can war foster cooperation?. The Journal of Economic Perspectives 30 (3), 249–274.
Bauer, P.J., Dow, G.A., 1994. Episodic memory in 16- and 20-month-old children: Specifics are generalized but not forgotten. Developmental Psychology 30 (3), 403–417.
Becchetti, L., Conzo, P., Romeo, A., 2014. Violence, trust, and trustworthiness: Evidence from a Nairobi slum. Oxford Economic Papers 66 (1).

Bernile, G., Bhagwat, V., Rau, P.R., 2017. What doesn't kill you will only make you more risk-loving: Early-life disasters and CEO behavior. The Journal of Finance 72 (1), 167–206.
Breuer, W., Riesener, M., Salzmann, A.J., 2012. Risk aversion vs. individualism: What drives risk taking in household finance?. The European Journal of Finance 20 (5), 446–462.
Brown, S., Taylor, K., 2014. Household finances and the "Big Five" personality traits. Journal of Economic Psychology 45, 197–212.
Browne, M.J., Kim, K., 1993. An international analysis of life insurance demand. Journal of Risk and Insurance 60 (4), 616–634.
Bucciol, A., Zarri, L., 2015. The shadow of the past: Financial risk taking and negative life events. Journal of Economic Psychology 48, 1–16.
Bundervoet, T., Verwimp, P., Akresh, R., 2009. Health and civil war in rural Burundi. Journal of Human Resources 44, 536–563.
Callen, M., Isaqzadeh, M., Long, J.D., Sprenger, C., 2014. Violence and risk preference: Experimental evidence from afghanistan. American Economic Review 104 (1), 123–148.
Cameron, L., Shah, M., 2015. Risk-taking behavior in the wake of natural disasters. Journal of Human Resources 50 (2), 484–515.
Carver, L.J., Bauer, P.J., 2001. The dawning of a past: The emergence of long-term explicit memory in infancy. Journal of Experimental Psychology: General 130 (4), 726–745.
Cassar, A., Grosjean, P., Whitt, S., 2013. Legacies of violence: Trust and market development. Journal of Economic Growth 18 (3), 285–318.
Cassar, A., Healy, A., Von Kessler, C., 2017. Trust, risk, and time preferences after a natural disaster: Experimental evidence from Thailand. World Development 94, 90–105.
Cesarini, D., Johannesson, M., Lichtenstein, P., Sandewall, , Wallace, B., 2010. Genetic variation in financial decision-making. The Journal of Finance 65 (5), 1725–1754.
Christelis, D., Jappelli, T., Padula, M., 2010. Cognitive abilities and portfolio choice. European Economic Review 54 (1), 18–38.
Cohn, R.A., Lewellen, W.G., Lease, R.C., Schlarbaum, G.G., 1975. Individual investor risk aversion and investment portfolio composition. Journal of Finance 30, 605–620.
Collier, P., 2004. The Second World War. The Mediterranean 1940–1945. Osprey Publishing, Oxford.
Conzo, P., Salustri, F., 2017. A war is forever: The long-run effects of early exposure to World War II on trust (No. 201735). University of Turin.
Croson, R., Gneezy, U., 2009. Gender differences in preferences. Journal of Economic Literature 47 (2), 448–474.
Dave, D., Saffer, H., 2008. Alcohol demand and risk preference. Journal of Economic Psychology 29 (6), 810–831.
Das, S., Kuhnen, C.M., Nagel, S., 2019. Socioeconomic status and macroeconomic expectations. Review of Financial Studies(in press).
Davies, N. (2006). Europe at War 1939-1945: No simple victory. Pan.
Decker, S., Schmitz, H., 2016. Health shocks and risk aversion. Journal of Health Economics 50, 156–170.
Dohmen, T., Falk, A., Huffman, D., Sunde, U., 2011. The intergenerational transmission of risk and trust attitudes. The Review of Economic Studies 79 (2), 645–677.
Eckel, C.C., El-Gamal, M.A., Wilson, R.K., 2009. Risk loving after the storm: A bayesian-network study of hurricane Katrina evacuees. Journal of Economic Behavior and Organization 69, 110–124.
Elder, G.H., 2018. Children of the great depression. Routledge.
Ellis, J., 1993. World War II: A statistical survey: The essential facts and figures for all the combatants. Facts on File
Figner, B., Knoch, D., Johnson, E.J., Krosch, A.R., Lisanby, S.H., Fehr, E., Weber, E.U., 2010. Lateral prefrontal cortex and self-control in intertemporal choice. Nature Neuroscience 13 (5), 538–539.
Fox, S.E., Levitt, P., Nelson III, C.A., 2010. How the timing and quality of early experiences influence the development of brain architecture. Child Development 81 (1), 28–40.
Friend, I., Blume, M.E., 1975. The demand for risky assets. American Economic Review 65, 900–922.
Giuliano, P., Spilimbergo, A., 2014. Growing up in a recession. The Review of Economic Studies 81 (2 (287)), 787–817.
Gottlieb, G., 1997. Synthesizing nature-nurture: Prenatal roots of instinctive behavior. Erlbaum, Mahwah, NJ.
Gottlieb, G., 1998. Normally occurring environmental and behavioral influences on gene activity: From central dogma to probabilistic epigenesist. Psychological Review 105 (4), 192–802.
Grosjean, P., 2014. Conflict and social and political preferences: Evidence from World War II and civil conflict in 35 European countries. Comparative Economic Studies 56 (3), 424–451.
Guiso, L., Jappelli, T., 2005. Awareness and stock market participation. Review of Finance 9 (4), 537–567.
Guiso, L., Haliassos, M., Jappelli, T., 2003. Household stockholding in Europe: Where do we stand and where do we go?. Economic Policy 18, 123–170.
Guiso, L., Sapienza, P., Zingales, L., 2008. Trusting the stock market. The Journal of Finance 63 (6), 2557–2600.
Havari, E., Peracchi, F., 2017. Growing up in wartime: Evidence from the era of two world wars. Economics & Human Biology 25, 9–32.
Hörl, M., Kesternich, I., Smith, J.P., Winter, J., 2016. Early-life circumstances predict measures of trust among adults: Evidence from hunger episodes in Post-War Germany (No. 6093). CESifo Group Munich.
Ichino, A., Winter-Ebmer, R., 2004. The long-run educational cost of World War II. Journal of Labor Economics 22 (1), 57–87.
Jensen, P.S., Shaw, J., 1993. Children as victims of war: Current knowledge and future research needs. Journal of the American Academy of Child & Adolescent Psychiatry 32 (4), 697–708.
Kesternich, I., Siflinger, B., Smith, J.P., Winter, J.K., 2014. The effects of World War II on economic and health outcomes across Europe. Review of Economics and Statistics 96 (1), 103–118.
Kim, Y.I., Lee, J., 2014. The long-run impact of a traumatic experience on risk aversion. Journal of Economic Behavior & Organization 108, 174–186.
Knudsen, E.I., 2004. Sensitive periods in the development of the brain and behavior. Journal of Cognitive Neuroscience 16 (8), 1412–1425.
Kusev, P., van Schaik, P., Ayton, P., Dent, J., Chater, N., 2009. Exaggerated risk: Prospect theory and probability weighting in risky choice. Journal of Experimental Psychology: Learning, Memory, and Cognition 35 (6), 1487–1505.
Lahmeyer, J. (2006), Populstat [online]. Available at http://www.populstat.info.
Li, J.-Z., Li, S., Wang, W.-Z., Rao, L.-L., Liu, H., 2011. Are people always more risk averse after disasters? Surveys after a heavy snow-hit and a major earthquake in China in 2008. Applied Cognitive Psychology 25 (1), 104–111.
Love, D.A., Smith, P.A., 2010. Does health affect portfolio choice?. Health Economics 19 (12), 1441–1460.
Lyubomirsky, S., 2010. Hedonic adaptation to positive and negative experiences. In: Folkman, S. (Ed.), The Oxford handbook of stress, health, and coping. Oxford University Press, New York, NY, US, pp. 200–224.
Macksoud, M.S., Aber, J.L., 1996. The war experiences and psychosocial development of children in Lebanon. Child Development 67 (1), 70–88.
Maddison A. (2008). Historical statistics: Statistics on world population, GDP and per capita GDP. http://www.ggdc.net/MADDISON/oriindex.htm.
Malmendier, U., Nagel, S., 2011. Depression babies: Do macroeconomic experiences affect risk-taking?. Quarterly Journal of Economics 126, 373–416.
Malmendier, U., Nagel, S., 2015. Learning from inflation experiences. The Quarterly Journal of Economics 131, 53–87.
Page, L., Savage, D.A., Torgler, B., 2014. Variation in risk seeking behaviour following large losses: A natural experiment. European Economic Review 71, 121–131.
Perner, J., Ruffman, T., 1995. Episodic memory and autonoetic conciousness: Developmental evidence and a theory of childhood amnesia. Journal of Experimental Child Psychology 59 (3), 516–548.
Sapienza, P., Zingales, L., Maestripieri, D., 2009. Gender differences in financial risk aversion and career choices are affected by testosterone. Proceedings of the National Academy of Sciences 106 (36), 15268–15273.
Stotland, E., Canon, L.K., 1972. Social psychology: A cognitive approach. Saunders Limited.
Van Rooij, M., Lusardi, A., Alessie, R., 2011. Financial literacy and stock market participation. Journal of Financial Economics 101 (2), 449–472.
Voors, M.J., Nillesen, E.E.M., Verwimp, P., Bulte, E.H., Lensink, R., Soest, D.P.V., 2012. Violent conflict and behavior: A field experiment in Burundi. American Economic Review 102 (2), 941–964.
Werner, E.E., 2000. Through the eyes of the innocents: Children witness World War II. Westview Press, Boulder, CO.

Yaari, M.E., 1965. Uncertain lifetime, life insurance, and the theory of the consumer. Review of Economic Studies 32, 137–150.